Typology of honey consumers with a university education in Mexico

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Abstract:

Mexico is a honey-producing country, paradoxically, its per capita consumption is low compared to European countries. The objective was to make a typology of honey consumers in Mexico with a minimum educational level of bachelor's degree in ages from 20 to 60 years and to determine their socioeconomic characteristics and aspects that motivate consumption. A questionnaire was applied to a sample of 1,003 honey consumers who met the conditions of age and school level. The information was analyzed using cluster and discriminant analysis. Three types of consumers were identified: 1) educated consumers with average income (34.4 %), they were those who consume honey frequently, have extensive knowledge about beekeeping by-products and honey properties, prefer to buy the product from

beekeepers; 2) highly educated consumers with high income (25.8 %), most of them have postgraduate degrees and receive income greater than $5,000 per week, they were people of mature age and with moderate consumption of honey, a third of this group only know honey, have knowledge of its properties and qualities, they are indifferent to the place of purchase; and 3) educated consumers with low income (39.8 %), it grouped young consumers who only have a bachelor's degree, their consumption is moderate, they prefer to buy the product in markets. The groups of consumers formed provide information on a segment of the honey market in Mexico, it is necessary to continue conducting research on issues related to consumption and preference of honey consumers in Mexico.

Key words: Honey consumption, Socioeconomic characteristics, Clusters.

Introduction

Honey is the main product obtained from beekeeping; it is defined as a sweet substance made by bees from the nectar of flowers, which they collect, combine with specific substances, transform and store to serve as energy food[1]. In 2019, Mexico produced 61.9 thousand tonnes of honey and during 2010-2019, the average annual growth rate was 1.2 %[2]. In 2019, 43.4 % of production went to Germany and the United States, and Mexico ranked among the first exporting countries[3].

Currently, there is a tendency in consumers to purchase food products with general (taste, price, safety, organic and certified) and subjective attributes related to environmental, social and ethical issues; in addition, they should promote health, well-being and reduce the risk of developing diseases[4,5].

Honey is a product appreciated for its properties and health benefits, as a sweetener and natural remedy; it contains carbohydrates, water, proteins, vitamins, minerals and phenolic compounds. Consequently, its intake is associated with a better antioxidant capacity, modulation of the immune system, antimicrobial activities, influence on lipid values, regulation of glycemic responses, among others[5]. This has contributed to the growing trend in world consumption, which, during 2008 to 2018, increased 5.3 % and in 2018, consumption was 2.55 million tonnes[6].

In contrast, in Mexico honey consumption has decreased; during 2017-2019, an apparent national consumption of 22.3 thousand tonnes was recorded[2,3]. From 2010, the trend in consumption was downward, with an average annual growth rate of -2.8 %, until 2019. Although the country is one of the main world producers, the Mexican population does not show a culture of honey consumption and it is reflected in the per capita consumption of 170 g, well below some European countries, which exceed 1,000 g per person per year[6].

There are studies that have determined the factors that influence honey consumption, among them sociodemographic factors such as age, occupation and education[7,8,9]. Other influencing factors were color, taste, variety and price[9,10]. In another study, it was mentioned that consumption is influenced by the income level of households and the purchase decision is determined by consumers' knowledge of the value of honey[11]. Attributes such as therapeutic properties have become important in the purchase decision and the product is valued as traditional, healthy and for its use in alternative medicine[5,12].

Studies conducted in Croatia, Romania, Italy, Serbia and Brazil[13-16] indicate that the educational level of the honey consumer is relevant and influences the purchase decision, because the person may have greater knowledge about the qualities of the product. This aspect should be considered for Mexico, where the studies conducted deal with the production chain, commercialization[17,18] and consumer preferences at the regional level[19]. However, information on the identification of consumer profiles and types for market segments is limited, even though this type of information contributes to the understanding of how consumption decisions are made, reveals information for agri-food chains and provides elements to producers and industrialists for value addition[16,20]. Knowing the types of consumers supports the design of market strategies that position the product in the market and motivate its consumption. Therefore, the objective of this work was to make a typology of honey consumers in Mexico with a minimum educational level of bachelor's degree in ages from 20 to 60 years and to determine their socioeconomic characteristics and aspects that motivate consumption.

Material and methods

Sample size

The type of research was exploratory, and the information was obtained through a structured survey. The sampling was directed to the Mexican honey-consuming population with

university education, between 20 and 60 years of age. The sample size was obtained using the simple random sampling formula for finite populations[21,22]:

$$n = \frac{Z^2 N\, pq}{(N-1)e^2 - Z^2 pq}$$

Where *n* was the sample size; *N* represents the population, equal to 57.34 million inhabitants, population between 20 and 60 years of age according to the Census of Population and Housing (INEGI)[23]; *Z* was the 90 % confidence level; *e* was the error of 4.1 %; *P* was the 50 % probability that the sample is representative, and *q* was the probability that the sample is not representative (*q=1-p*). The estimated sample size was 990 surveys, but in practice 1,003 were conducted.

Instrument used and sources of information

The information was collected through a questionnaire of 15 questions on age, gender, schooling, size of the city where they lived, weekly income, monthly consumption of honey, habits in the consumption of honey, place of purchase, consumer knowledge of properties and uses and by-products of honey. The questions were closed with dichotomous, multiple and scale answers[24].

The design of the survey was made on the Google Apps server through Drive®, where the name of the survey was first established and each of the questions raised with their respective answers was described. Subsequently, the link that indicates the abbreviation of the URL was generated. Prior to the application, pilot tests were conducted to ensure the clarity of the questions and minimize errors (n= 10). Once validated, the survey was applied via the internet, sharing the link in social networks. With the information obtained, a database was created in Excel 2016 spreadsheets.

Statistical analysis

The typology of honey consumers was made using multivariate techniques, first a hierarchical cluster (CA) and K-mean analysis was applied. The hierarchical CA was based on Ward's grouping method and was used to identify the number of groups graphically and by means of Mojena's criterion ($\tilde{\alpha} + ks_\alpha$); where $\tilde{\alpha}$ is the mean of the Euclidean distances, s_α is the standard deviation of the distances and k is a constant[25]. Subsequently, the analysis was complemented with that of K-means for a better identification of the groups.

To verify and validate the results obtained in the CA of K-means, the classification and assignment of each individual to the group formed was evaluated with a discriminant analysis (DA)[22,26]; where the independent variables that most discriminated against the groups were determined and it was verified that the conformation of groups of the CA was robust. In the DA, the stepwise variable selection method was used. To select the variables, the Wilk's statistic Lambda was used, which, for its interpretation, considers that, if its value is close to zero, the total variability will be due to the differences between groups and, therefore, the corresponding set of variables will discriminate against the groups. If its value is close to 1, the groups will be mixed and the set of independent variables will not be suitable for constructing the discriminant functions[27,28]. The statistical analysis of the data was performed with the SPSS 27.0 software for Windows[29] and Minitab 18.1.

Results

Statistical results

The hierarchical CA allowed identifying graphically three types of honey consumers (Figure 1), likewise this result was corroborated by estimating Mojena's Criterion, where $\tilde{\alpha}= 2.68$, $k= 1.25$ and $s_{\alpha}=0.54$, which resulted in 3.35. The number of clusters identified in the hierarchical CA was used for the CA of K-means.

Figure 1: Dendrogram of honey consumers with university education in Mexico
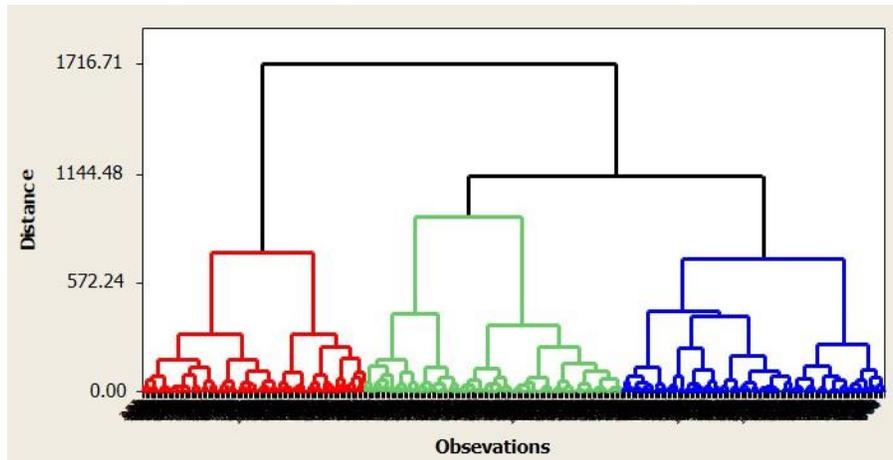
The groups of honey consumers formed were analyzed by a discriminant analysis to verify the goodness of the classification. With the analysis, it was determined that 97.5 % of the respondents were classified correctly and, therefore, the classification in three clusters was

valid. Similarly, the Wilk's statistic Lamda of 0.115, a value close to zero, means that the groups formed were statistically different (Table 1).

Table 1: Multivariate statistics

Statistic	Value	Fisher distribution value	Degrees of freedom of the numerator	Degrees of freedom of the denominator	Probability greater than F calculated
Wilk's Lambda	0.115	255.14	12	1990	<0.000

According to the values obtained, Wilk's Lamda and the F statistic, six of the nine variables (weekly income, age, monthly consumption, motivation to consume, by-products and place of purchase) contributed to the discrimination of groups by their level of $P>0.05$ and F value greater than 3.8. The variables that did not contribute to the separation of groups were gender, form of consumption and size of the city (Table 2).

Table 2: Mean test between the differentiated groups

Variable	Wilk's Lambda	F	Significance
Gender	0.994	3.242	0.059
Age	0.695	219.515	0.000
Weekly income	0.321	1058.353	0.000
Size of the city	0.999	0.610	0.543
Monthly consumption	0.716	198.139	0.000
Form of consumption	0.991	4.471	0.062
Place of purchase	0.908	50.893	0.000
By-products	0.920	43.663	0.000
Motivation to consume	0.791	132.168	0.000

Characterization of the types of honey consumers

Once the types of consumers were defined, they were characterized based on the variables included in the analysis (Tables 3 and 4) and the particularities of each one were determined. The name assigned to each group was considering the educational level and weekly income.

Group 1: Educated consumers with average income

This group consisted of 345 consumers (34.4 %), of which 64.6 % were women and the rest were men. Most of the people in this group were women aged 26 to 40 and adults aged 41 to 60, and just over half have postgraduate studies. With respect to income, the population was concentrated in the middle categories (more than $3,000 per week) and they live in large cities (Table 3). It was identified that they were the most frequent consumers of honey for sweetener or home remedy. They acquire honey directly from the beekeeper, they know more about the derivatives of the hive and their reasons for purchase are related to the natural properties of honey (Table 4).

Table 3: Socioeconomic and demographic characteristics of the types of honey consumers (%)

Variables	Group 1 (n=345)	Group 2 (n=259)	Group 3 (n=399)
Gender			
Men	35.4	40.2	30.6
Women	64.6	59.8	69.4
Age			
From 20 to 25 yr old	4.9	6.6	56.4
From 26 to 40 yr old	47.8	59.1	33.8
From 41 to 60 yr old	47.2	34.4	9.8
Schooling			
Bachelor's degree	46.4	37.8	81.2
Postgraduate degree	53.6	62.2	18.8
Weekly income			
Less than 1,500	3.2	0.0	54.9
From 1,500 to 3,000	26.1	0.0	44.6
From 3,000 to 5,000	32.2	31.7	0.5
More than 5,000	38.6	68.3	0.0
Size of the city			
More than 100,000	59.4	59.1	55.4
From 30,000 to100,000	20.3	20.1	22.3
From 10,000 to 30,000	9.6	10.4	10.0
Less than 10,000	10.7	10.4	12.3

Table 4: Characteristics in honey consumption by type of consumer (%)

	Group 1 (n=345)	Group 2 (n=259)	Group 3 (n=399)
Monthly consumption			
10 g	0.9	31.7	27.6
50 g	11.9	32.0	33.8
100 g	39.1	29.7	27.3
500 g	48.1	6.6	11.3
How do you consume honey?			
Sugar substitute	71.0	65.6	61.7
Home remedy	25.5	32.0	32.1
In cosmetics	3.5	2.3	6.2
Where do you buy it?			
Market	20.0	44.4	52.6
Self-service store	12.2	23.6	8.3
Beekeeper	67.8	32.0	39.1
By-products of beekeeping you know			
Honey	8.1	31.3	26.6
Honey, pollen, royal jelly	23.5	29.3	30.3
Honey, pollen, royal jelly, apitoxin	68.4	39.4	43.1
Why do you consume honey?			
Because of its properties	63.8	14.7	23.6
It is a natural product	25.8	32.4	34.6
It is a healthy product	9.9	35.5	24.3
Because of family custom	0.6	17.4	17.5

Group 2: Highly educated consumers with high income

The second group was made up of 259 consumers, 25.8 % of the respondents. This group is composed mostly of mature consumers between 26 and 40 yr of age, located in large cities. This group was characterized by having the highest school degree and high income (Table 3). They showed a low consumption of honey, and they are indifferent to where to buy it, the motivation they have to acquire it is associated with the idea of consuming a natural and healthy product, but they also do it because it is a family custom.

Group 3: Educated consumers with lower incomes

Group three consisted of 399 consumers, which corresponded to 39.8 % of the sample. The members were young people with a bachelor's degree and weekly income of less than $3,000. They showed a low consumption of honey and they used it as a sugar substitute. This type of consumers had a preference to buy the product in markets and directly from beekeepers, they have knowledge of the products derived from the hive and their purchase motivations are determined by the fact that it is a natural, healthy product with properties, and by family custom.

Discussion

The results obtained in the characterization were similar to those found in a comparative analysis on honey consumption in Romania, Italy and Serbia, where it was mentioned that the educational level and the amount of income participate in the behavior of honey consumers in those countries[13]. In several studies on honey, it is mentioned that the sociodemographic factors that positively influence consumption were the age, gender, educational level and income of people[30,31]. This same condition was reflected in this analysis, where the main variable that segmented the population studied by type of consumers was income. In other European countries, honey is considered an expensive product compared to other sweeteners, so its acquisition is conditioned to the income of the consumer[5,9,14], this explanation describes the condition of Mexican consumers.

A second variable that influenced the differentiation of the groups was age; although a sample in ages between 20 and 60 years was considered, the difference between the groups by age ranges was noticeable; in the first group, no predominant range was observed; however, group 2 was made up of mature people and group 3 was made up of the youngest. It is assumed that older generations consume honey more frequently than younger consumers[30,32,33]; these characteristics of consumption coincided with the Mexican consumers interviewed, since the adult population of group 1 were the ones who consume the most and the young people of group 3 were the ones who consume the least.

On the other hand, a greater trend of honey consumption in women has been identified in other parts of the world[9] and that this consumption tends to increase when it comes to health care, both in prevention and treatment of diseases[34,35,36]. In this regard, it was found that most of the interviewed population were also women, and they consume honey.

In addition to the above, the consumption of honey of groups 1 and 3 is directly related to the age, educational level, gender and income of consumers. However, consumers in group 2 do not meet these conditions, as they are highly educated people, with high income, of middle aged and low consumption. This behavior can be due to several factors, for example, in Slovakia and Romania[34], family size and frequency of honey consumption during childhood are determinants in the consumer profile.

With regard to the motivation to consume honey, it was observed that, in the three groups, the properties of the product and its natural origin are appreciated and they conceive it as a healthy product, these results were similar to those reported in studies carried out in European countries[5,9], where they mention that the perception that consumers have about honey is usually more important in the purchase decision than the price it can have in the market. The perception of honey has developed in recent years and was the product of a greater knowledge of consumers about its properties and contributions to human health, so it is now recognized as a natural sweetener, healthy food and there is information on the numerous therapeutic properties it has[5]. In addition to the above, it is assumed that the educational level of the sample influenced the perception of the consumers surveyed, since, as Lucchese and Gerber[16] mentioned, at a higher school level, the discourse of the benefits of honey is oriented to the nutritional aspect, associated with the advantages of consuming vitamins, nutrients and medicinal qualities that contribute to having good health and better quality of life.

A difference that was distinguished between groups was consumption due to family tradition, mainly in groups 2 and 3. In a study conducted on young Poles[37], it was mentioned that this type of population consumes honey due to family tradition and the eating habits learned from their families; this same situation occurs with young Mexican consumers, who preserve their eating habits until their adulthood.

The most frequent consumers, who were those of Group 1, showed greater knowledge of the by-products of the hive and they buy honey directly from beekeepers, this result coincided with the behavior of consumers in Croatia, where 75 % of them buy honey directly from producers[15]. However, the place of purchase of honey provides important information about the consumer and the commercialization of the product. Acquiring it directly from the beekeeper indicates that consumers link foods to a concept of natural goods or services produced by companies in rural areas, with an established socioeconomic identity that they tend to prefer[38]. On the other hand, the predominance of beekeepers as the main points of sale is confirmed, who maintain an important market share in frequent consumers, in addition to pointing out that honey is marketed without a brand and label, which are extrinsic aspects of quality and are not very relevant for consumers. In this regard, Arvanitoyannis and Kristallis[14] pointed out that these consumers are traditional and they acquire quality through criteria based on experience and a personal relationship between consumer and beekeeper.

On the other hand, group 3 showed a greater tendency to buy honey in markets and in a smaller percentage from beekeepers; whereas, for Group 2, a preferred place to make the purchase was not observed, which denotes that this type of consumer does not base its decision criteria on this aspect.

The classification made in this study considered only one segment of the honey market, represented by consumers with university education between 20 and 60 yr of age. These particularities of the study were considered relevant because, in the case of Mexico, there are no studies focused on specific market segments, in addition to the fact that, when conducting the survey on line, the level of participation of this segment of the population has been observed to be higher, as indicated by studies carried out in Romania[14] and Croatia[15], which highlight the greater participation of consumers with a high educational level in the answering of online surveys.

Although numerous studies on profiles and types of honey consumers have been conducted in other countries[13,15,30], in Mexico this has been a little explored topic. The importance of this type of studies is highlighted by the way in which it allows producers to target their product and promote a better commercialization of it. One of the limitations of this study was that variables about tastes and preferences, consumer perception of quality, types of honey and extrinsic characteristics that are appreciated in other countries were not included[39]. The results obtained represent a first approach to the types of honey consumers for the case of Mexico. Likewise, it is important to conduct this type of analysis for other market segments that allows identifying opportunities for the increase in national honey consumption.

Conclusions and implications

The typology obtained showed the differences that exist between honey consumers with university education in an age range of 20-60 yr in Mexico. This type of consumers is grouped into three groups, the first consists of educated consumers with an average income and they differed from others because they consume honey frequently, have extensive knowledge of the by-products of beekeeping and properties, prefer to buy the product directly from beekeepers. A second group is the one made up of highly educated consumers, having mostly postgraduate degrees and receiving high incomes, these are people of mature age and with a moderate consumption of honey, even when they have knowledge of the properties and qualities of the product. A third of this group only know honey and no other by-product and they are indifferent to the place of purchase. Group 3, which consists of educated consumers with low incomes, groups young consumers who only have a bachelor's degree, their consumption is moderate, and they prefer to buy the product in markets. Those in group

1 were the most frequent and receptive consumers of honey and, therefore, potential consumers. Therefore, it is necessary to define strategies for promoting the product to inform the positive and healing aspects of honey and thus reinforce their knowledge and purchase decision. The strategy for consumers of groups 2 and 3 should focus on publicizing beekeeping as a sustainable activity, showing the different products derived from honey and the benefits of each by-product. Local honey producers should be aware that the reactivation of the beekeeping sector in Mexico could be achieved through the promotion of domestic consumption. Although the results obtained in this study are not definitive, the findings could have repercussions on producers and marketers, in order to potentiate the consumption of honey in Mexico through effective marketing strategies for each consumer profile. It is recommended to study other market segments, deepen in the analysis of consumption preferences and the influence of motivational and subjective aspects on the consumption of honey in Mexico.

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